10.3.2 User Newsletter

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This is the third user newsletter for Beamline 10.3.2. Since the last newsletter, we've had two more users, both of whom went home with good data.

Now for a status update of the various systems which were being worked on at the time of the last newsletter:

Optics

The plan for the April upgrade has changed. Instead of a 4-crystal mono, we will simplify to a two-crystal mono, using a Huber for the rotation. This will be stiff enough to avoid the stiction problems we've been having, and it will also allow us to make the cooling lines coaxial with the rotation axis, thus permitting the full range of Bragg angles. The present system limits the allowable Bragg angle to about 46^{o}. This change affects one user that I know of. The latest concept is to make the mono a fixed-exit design by translating one of the crystals perpendicular to itself. This type of mono is a 'stock' design, so can be used with minimal re-engineering. More as the design develops.

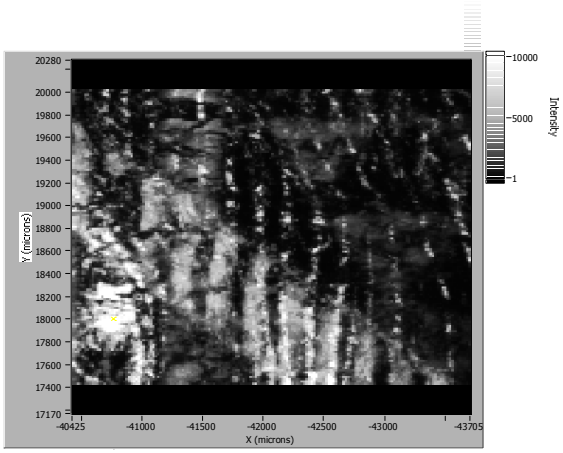
Detector:

Now for some good news: the 7-element detector is back and working well. One of the elements was repaired and now works as well as the others. The main source of the electrical noise I was fighting turned out to be the LN2 auto-fill system, which was coupling in noise via the capacitance between the fill cap and the dewar. A ground strap in the right place fixed that. The detector still 'freezes' up on occasion, and XIA has no ETA for a fix, but the workaround I proposed in the last newsletter has been tested and is

effective, at least for a 1μs shaping time. I have measured the deadtime for this shaping time and found it to be 3.2 μs for a single detector, which XIA says is consistent with their estimate. The EXAFS data editor now includes a deadtime correction screen.

Software:

The XY mapping is now working! As an example, here's a map of a dollar bill, taken in Fe fluorescence. One of the security features of US currency is that the black ink is slightly magnetic due to the presence of some Fe-rich addition. The large blob in the lower left corner is Washington's eyeball.



FeK_α excited at 8979eV

I've also scanned a real (not test) sample which a user had previously done on 10.3.1, getting better data with a 50ms dwell time/pixel than he had gotten with 1.5sec/pixel. Actual science is now being done using the XY scan facility.

The software allows one to display any of the ROIs while acquiring data, change the scaling of the display and save the data. In addition, it lets you use cursors to move to a feature of interest and sit there or scan in a smaller range.

Ease of use and miscellaneous issues

The channeltron mentioned in the last newsletter was tested. It works, but it picks up a lot of stray X-rays which negated its usefulness as an I_0 detector Instead, we're now using a miniature ion chamber consisting of two small Cu paddles on the ends of coax cables right after the exit window. Crude as that setup is, it is linear and works well enough for EXAFS use.

The XY scan program is somewhat complicated and needs a manual, or at least a good cheat-sheet. There is now a simple data viewer for XY scan files. This program lets you examine any ROI and save the result in a new file whose format is the same as the original. It also allows tricolor maps in which three elements are represented as red, green and blue. These images can be saved as .BMP or .JPG files.

There is a standalone program which allows one to navigate on the sample using the stage without having to have the XY scan or linescan screen up

The deadtime correction for EXAFS is easy enough to use for a single detector, but would require the user to do the same operation 7 times for the 7-element detector. I'll work on making that more automatic. In many cases, the count rates on the individual detectors are similar enough so that you can correct the sum by assuming an aggregate deadtime of $1/7^{th}$ that of a single detector.